CBCS SCHEME

USN | | | | | | | | | | 21CIV14/24

First/Second Semester B.E./B.Tech. Degree Examination, Dec.2024/Jan.2025

Elements of Civil Engineering and Mechanics

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Explain briefly the scope of civil engineering in
(i) Structural engineering (ii) Transportation engineering. **(08 Marks)**

b. Enumerate the qualities of good bricks. **(06 Marks)**

c. Name any five types of cements and state their use. **(06 Marks)**

OR

2 a. Briefly explain the role of civil engineers in the development of infrastructure. **(08 Marks)**

b. What are the ingredients of ordinary portland cement with their range? **(06 Marks)**

c. List the advantages of RCC and PSC. **(06 Marks)**

Module-2

3 a. State and prove parallelogram law of forces. **(06 Marks)**

b. Find the moment of force about A and B for the 30 kN force shown in Fig.Q3(b).

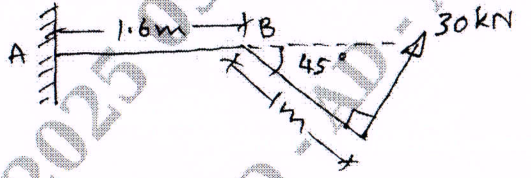

Fig.Q3(b) **(06 Marks)**

c. Two identical rollers each weighing 200 N are placed in a trough as shown in Fig.Q3(c). Assuming all contact surfaces are smooth, find the reactions developed at contact surfaces A, B, C and D.

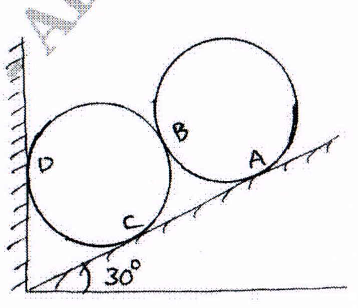

Fig.Q3(c) **(08 Marks)**

OR

4 a. State and prove Varignon's theorem. **(06 Marks)**

b. Determine the magnitude and direction of force 'P' which keeps concurrent system in equilibrium. [Refer Fig.Q4(b)]

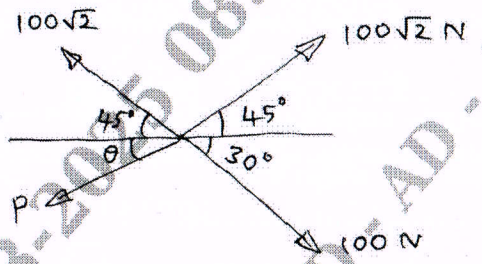

Fig.Q4(b) **(06 Marks)**

c. Determine the angle 'θ' for the system of strings ABCD in equilibrium as shown in Fig.Q4(c).

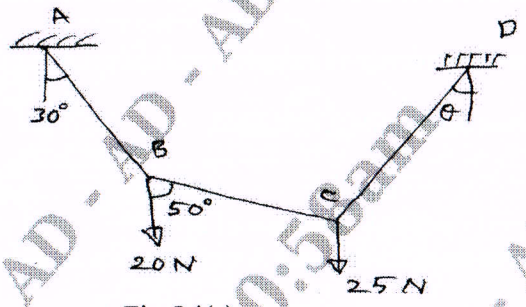

Fig.Q4(c) **(08 Marks)**

Module-3

5 a. State and prove parallel axis theorem. **(08 Marks)**

b. Determine the position of centroid for the lamina with a circular cutout shown in Fig.Q5(b).

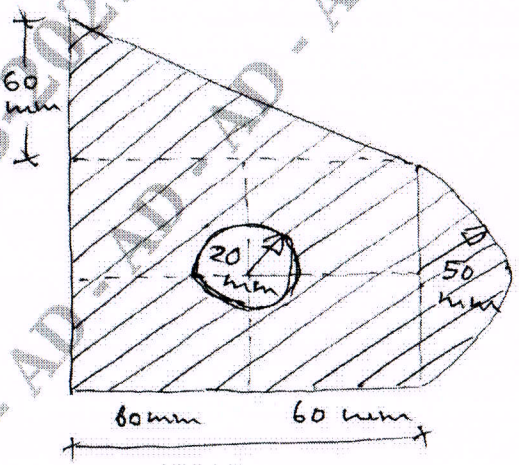

Fig.Q5(b) **(12 Marks)**

OR

6 a. Determine the centroid of a triangle of base 'B' and height 'H'. **(08 Marks)**

b. Find the moment of inertia and radius of gyration of a prestressed concrete beam section shown in Fig.Q6(b) about horizontal and vertical axis passing through the centroid.

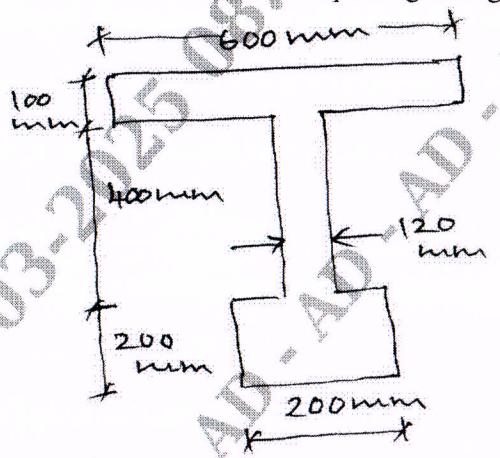

Fig.Q6(b) **(12 Marks)**

Module-4

7 a. Explain with neat sketches the different types of supports. **(06 Marks)**

b. Determine the reactions at A and B for the beam shown in Fig.Q7(b).

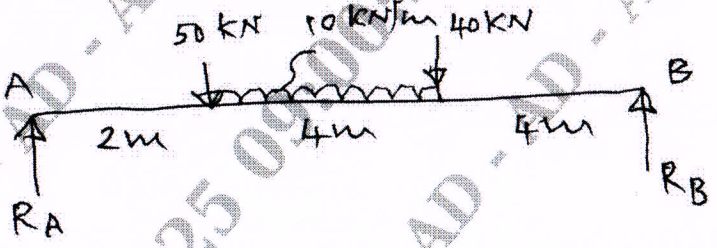

Fig.Q7(b) **(07 Marks)**

c. Determine the forces in the members BC, CF and FE by the method of sections as shown in Fig.Q7(c).

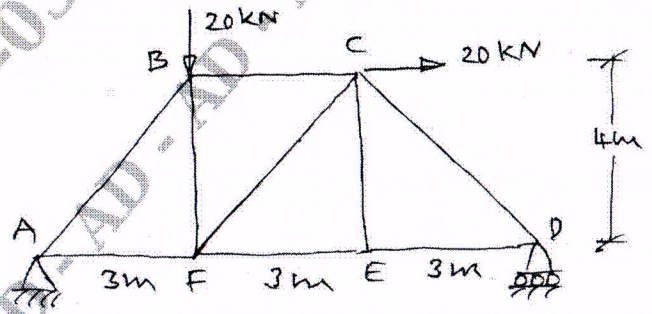

Fig.Q7(c) **(07 Marks)**

OR

8 a. List the steps followed in the analysis of trusses by method of joints. **(06 Marks)**

b. Determine the reactions at A and B for the loaded beam as shown in Fig.Q8(b).

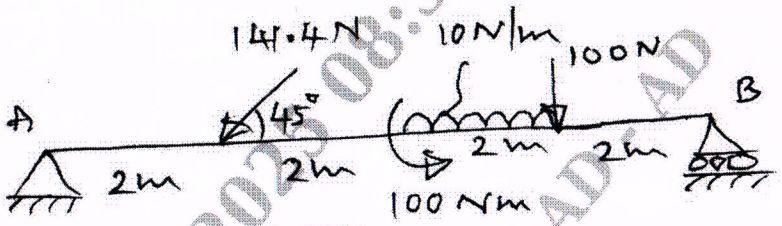

Fig.Q8(b) **(07 Marks)**

c. Find forces in members of truss shown in Fig.Q8(c) using method of joints and tabulate member forces.

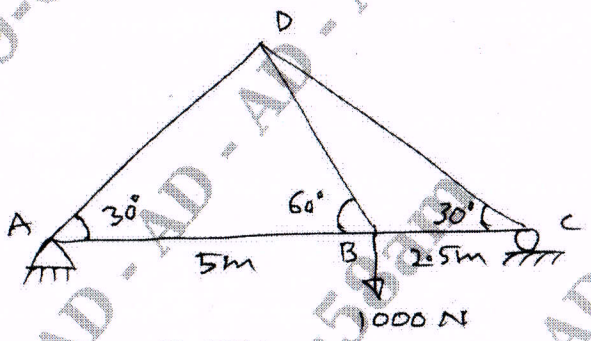

Fig.Q8(c) **(07 Marks)**

Module-5

9 a. What is projectile? Define the following terms briefly with sketch:
(i) Angle of projection (ii) Horizontal range (iii) Vertical height (iv) Time of flight **(10 Marks)**

b. A police officer observes a car approaching at a constant speed of 60 kmph. He gets on his motor cycle and starts chasing the car just as it passes in front of him. After accelerating for 10 seconds at a constant rate, the officer reaches his top speed of 75 kmph. How long does it takes the officer to overtake the car from the time he started? **(10 Marks)**

OR

10 a. What is super elevation and what is its necessity? **(04 Marks)**

b. State and explain D'Alembert's principle. **(04 Marks)**

c. A cricket ball thrown by a player from a height of 2 m above the horizontal ground at an angle of 30° to the horizontal and with a velocity of 12 m/s. The ball hits the wicket at a height of 0.6 m above the ground. How far is the player from the wicket? **(12 Marks)**

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